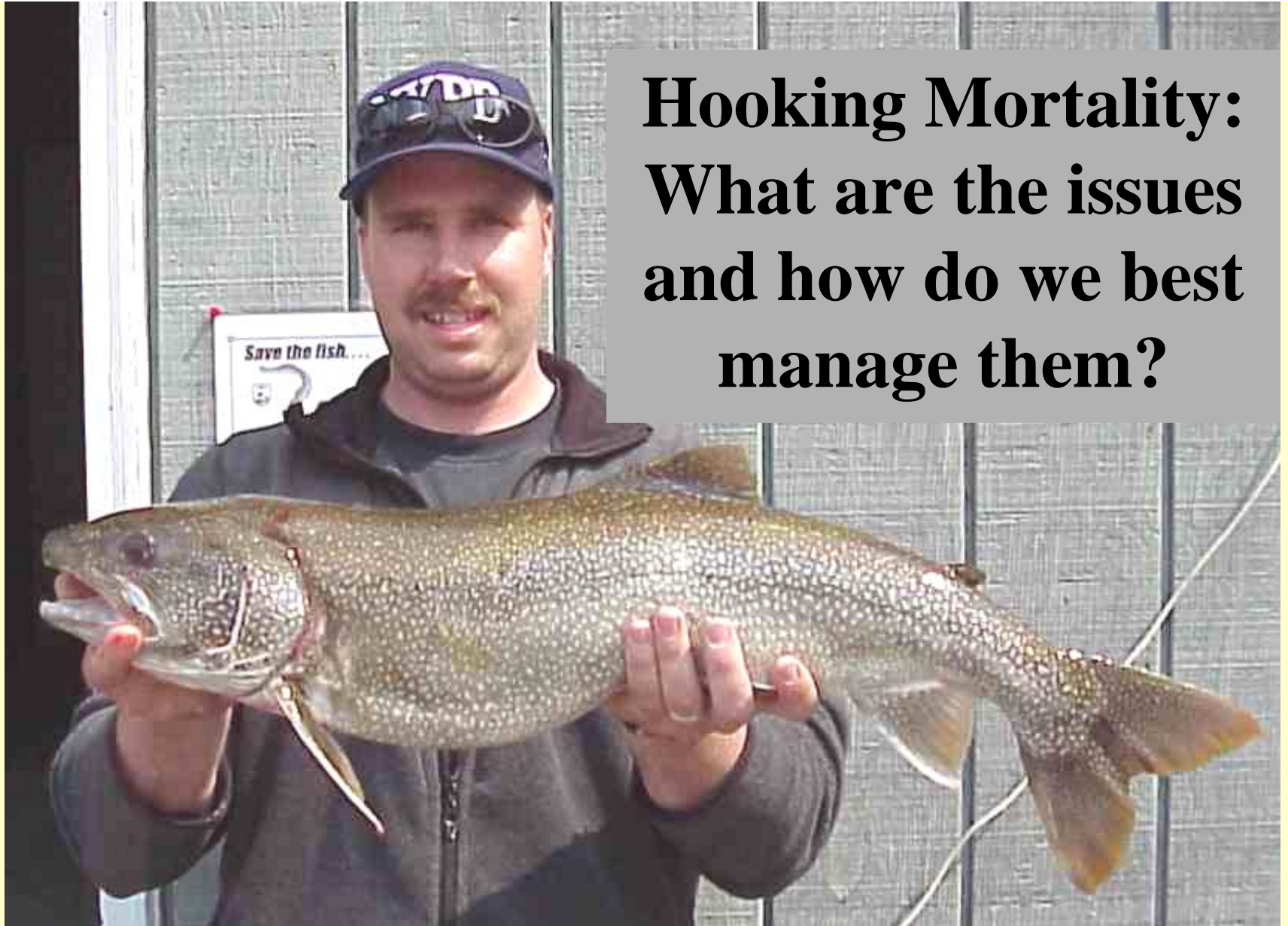


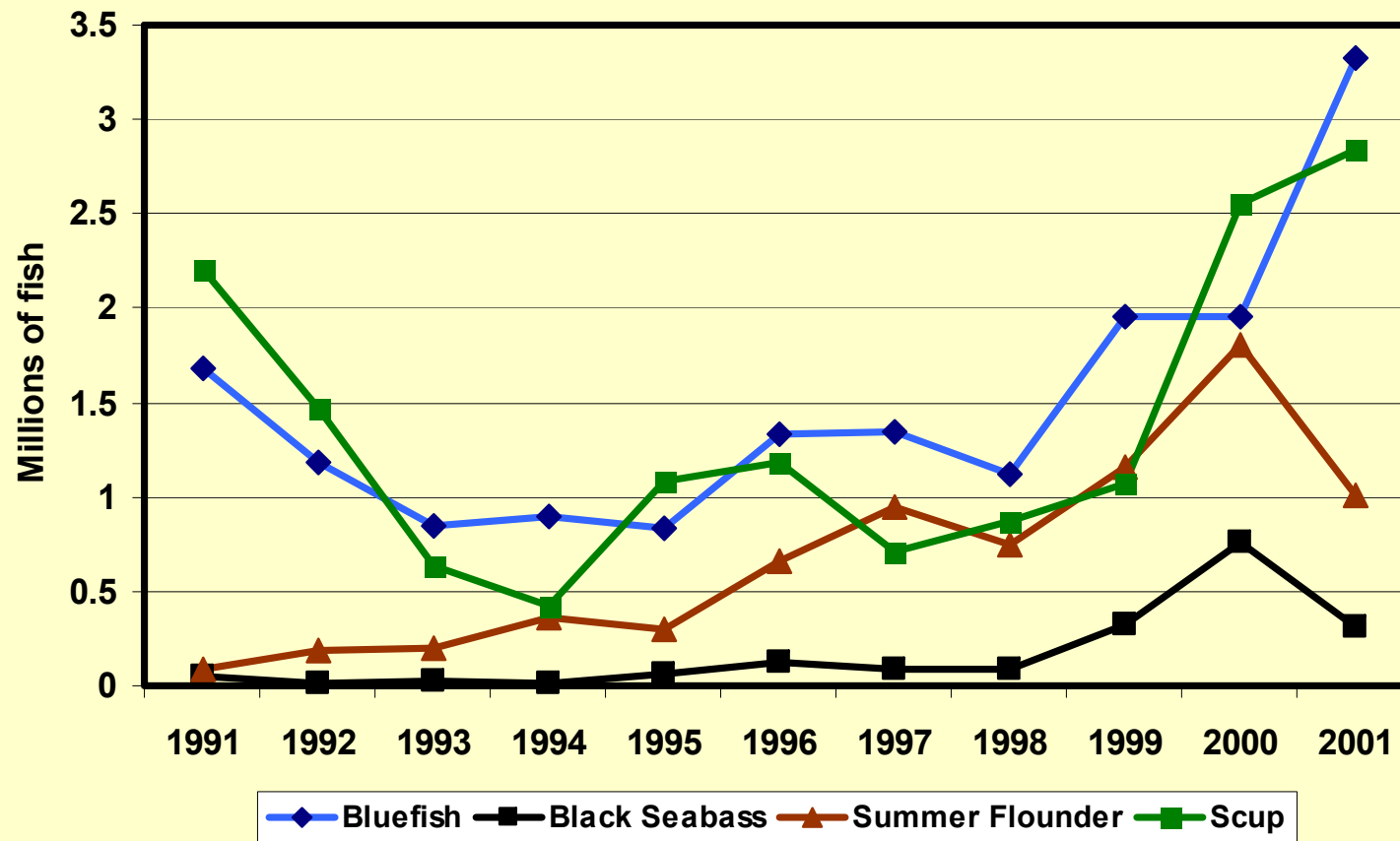
Hooking Mortality: What are the issues and how do we best manage them?



**Mark Malchoff,
Lake Champlain Sea Grant
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MRFSS B2 TRENDS



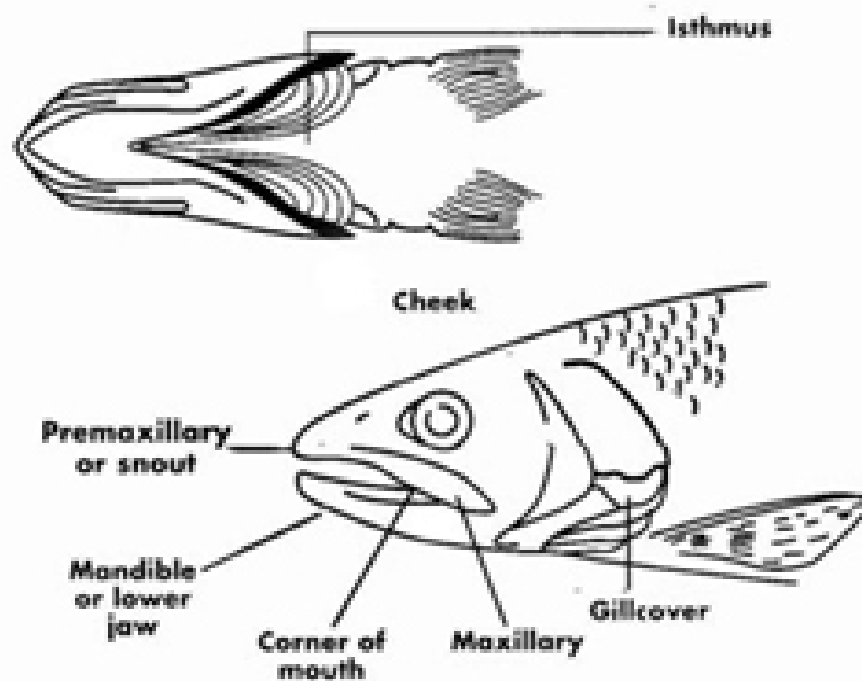
Personal communication from the NMFS,
Fisheries Statistics and Economics Division,
Silver Spring, MD

Hooking Mortality

- **Wounding**
- **Stress**
- **Depressurization or barotrauma**

Causes of Mortality: Hook Wounding

Wounding Mortality



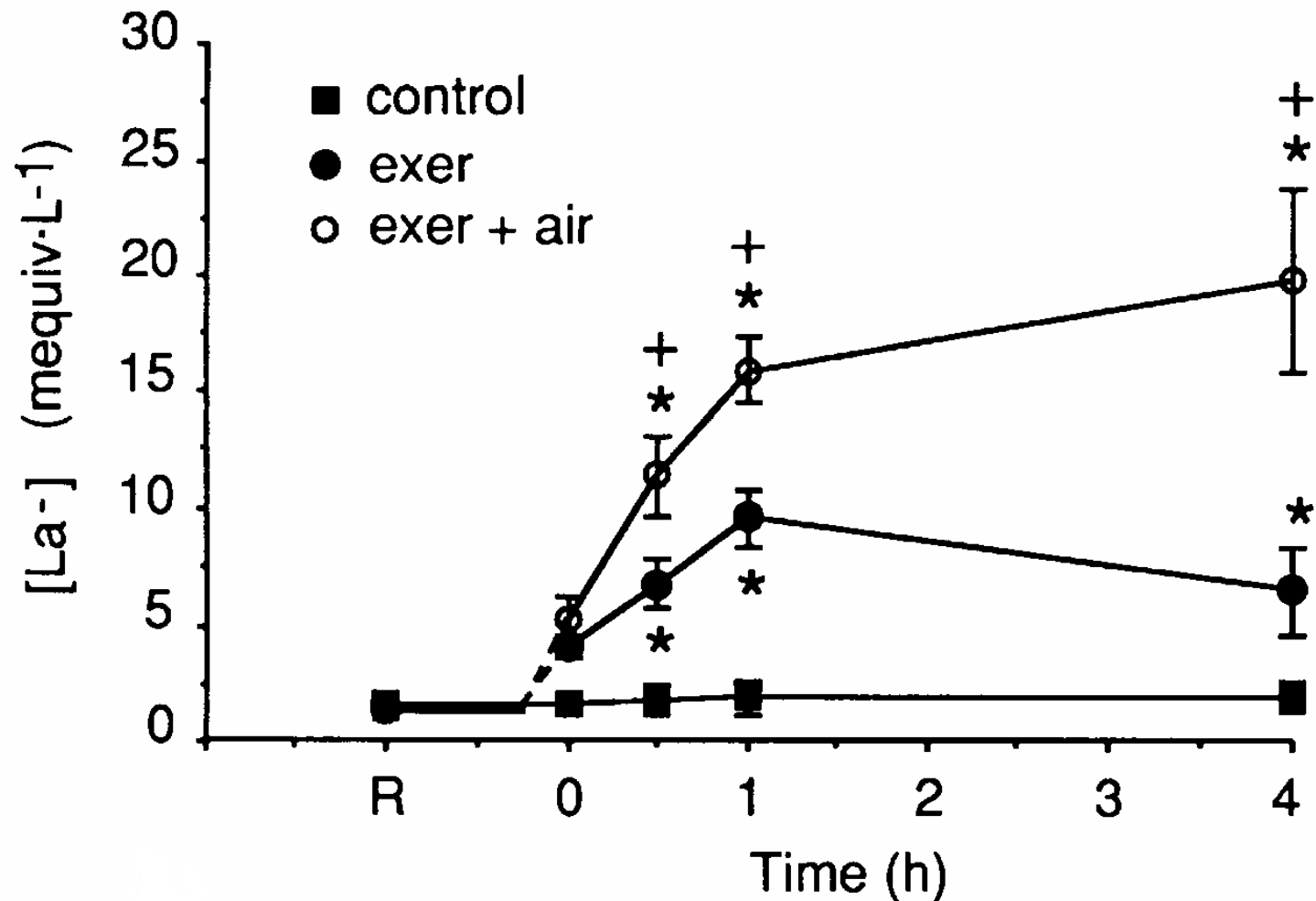
Lowest wounding mortalities of sport-caught fish occur when related to hooking in the snout, maxillary, corner of mouth and cheek.

Causes of Mortality: Angling Stress

General Pattern

- muscular exertion**
- production of lactic acid ($C_3H_6O_3$) in muscle tissues**
- increase in blood lactate**
- decrease in blood pH (blood becomes more acid- “blood acidosis”)**
- fish has problems regulating exchange of ions (H^+ , CO_3 , etc.) between body tissues and the water**

Blood Lactate in rainbow trout



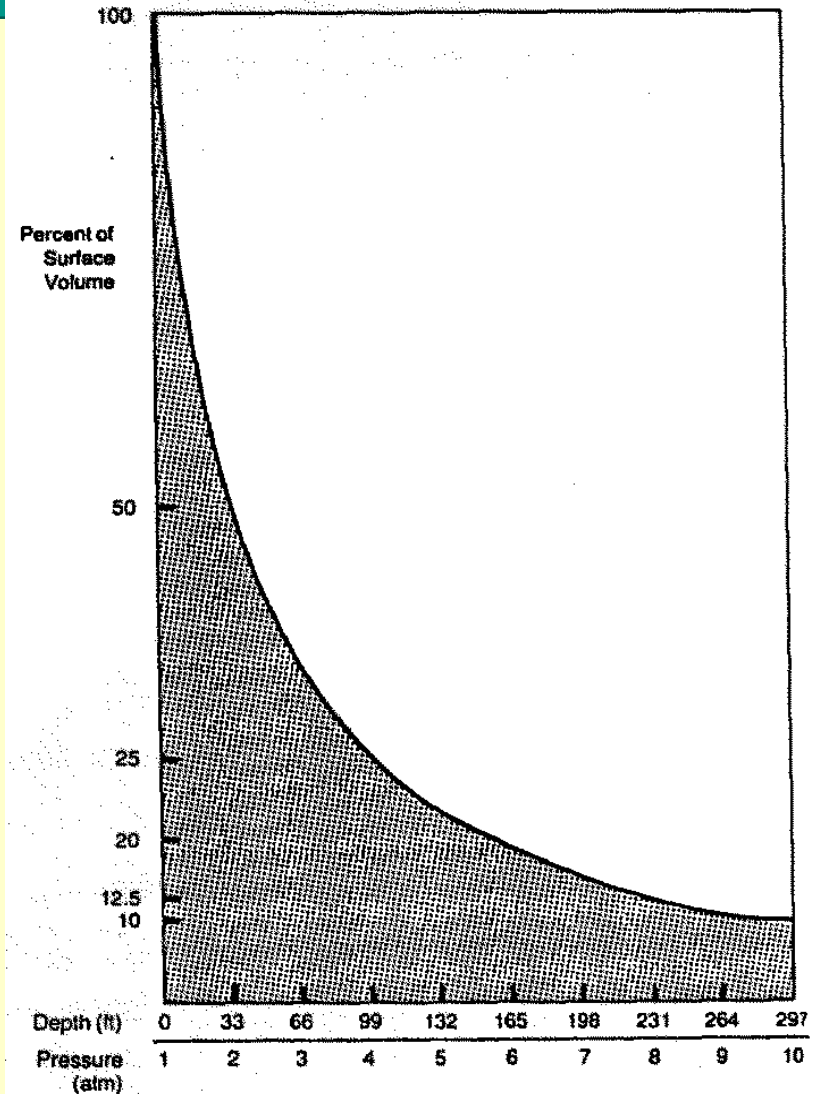
Blood lactate concentration ([La⁻]) in rainbow trout at rest (R) and after 0, 0.5, 1, and 4 hrs under control conditions (■), following exhaustive exercise (●) or exh. exercise plus 60 s of air exposure (○).
(From: Ferguson and Tufts, 1992).

Causes of Mortality

Barotrauma

- Swimbladder overinflation/rupture
- Displacement of stomach or intestines
- Bulging eyes

■ More info at:
<http://edis.ifas.ufl.edu/SG047>



Research Issue

Can hooking mortality be reduced?

Much of recent research has dealt with issues of

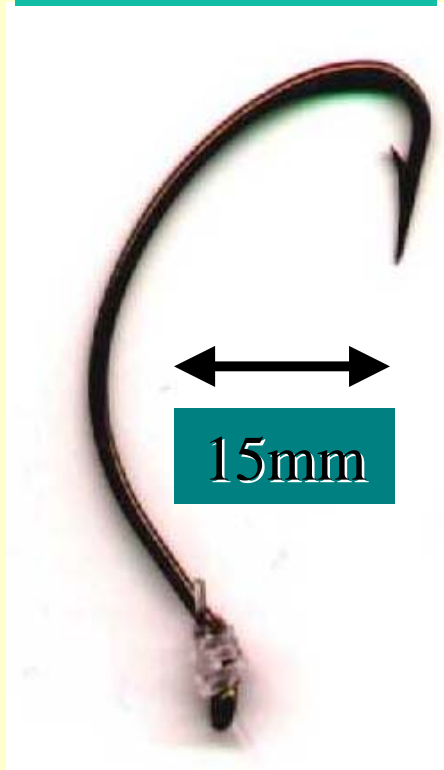
- **artificial lures vs. bait**
- **hook style/size**
- **role of water temperature**
- **other variables**

Hook Styles and Sizes

Sproat
Size 2/0



Wide Gap
Size 2/0



Circle
Size 4/0



Methods

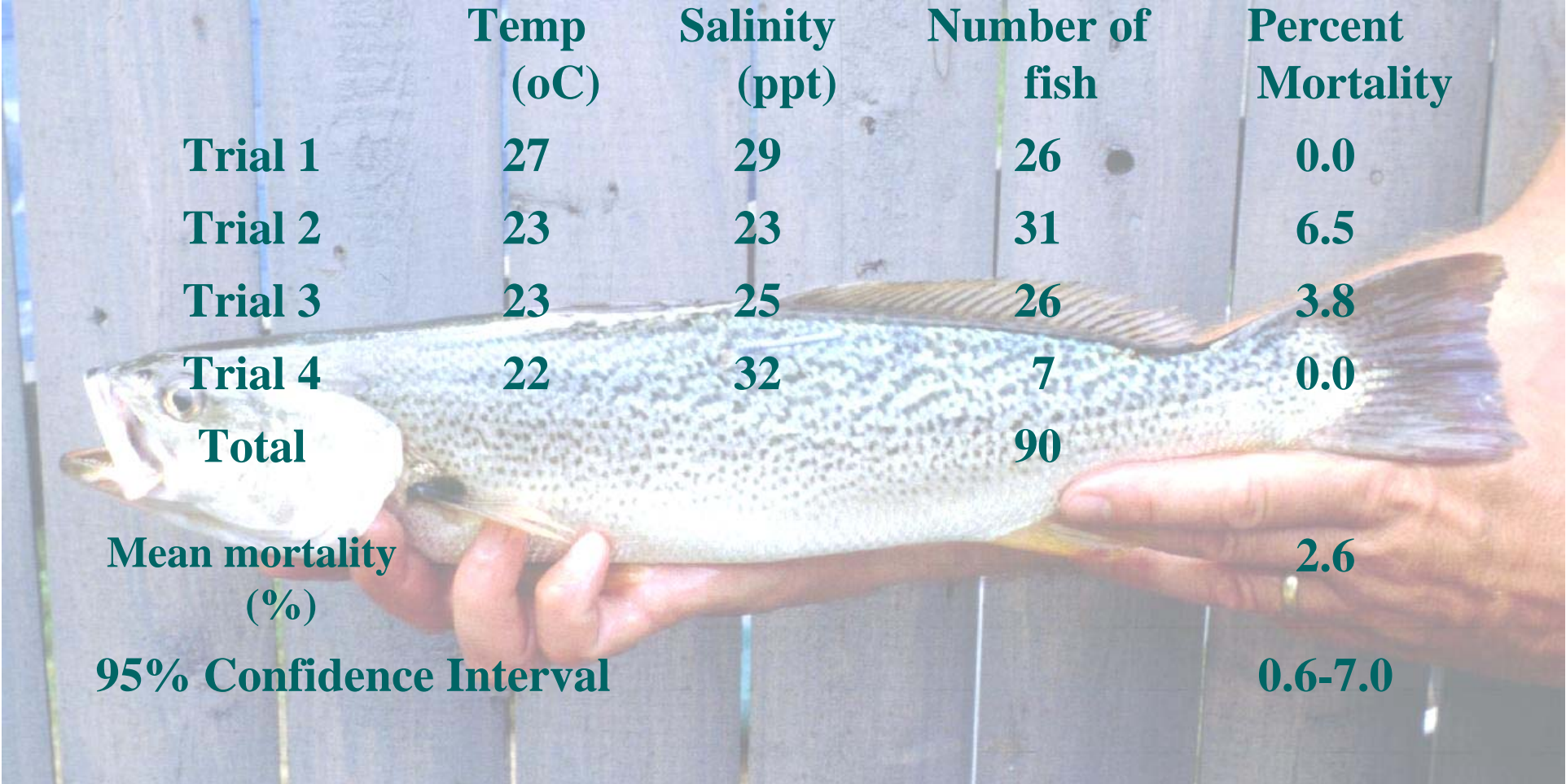
(used by Malchoff and others)

- Series of angling trials (10 to 25 fish/ trial)
- All fish tagged and caged near angling site. Recorded hook style/size, hook removal status (left or removed) wound location, presence of bleeding, salinity and water temp.
- All fish recovered after 72 hours. Mortalities expressed as percentage of total number of fish in each trial.
- Bootstrapping to develop mean mortality w/ 95%C.I.
- Modeled mortality using logistic regression

Field methods

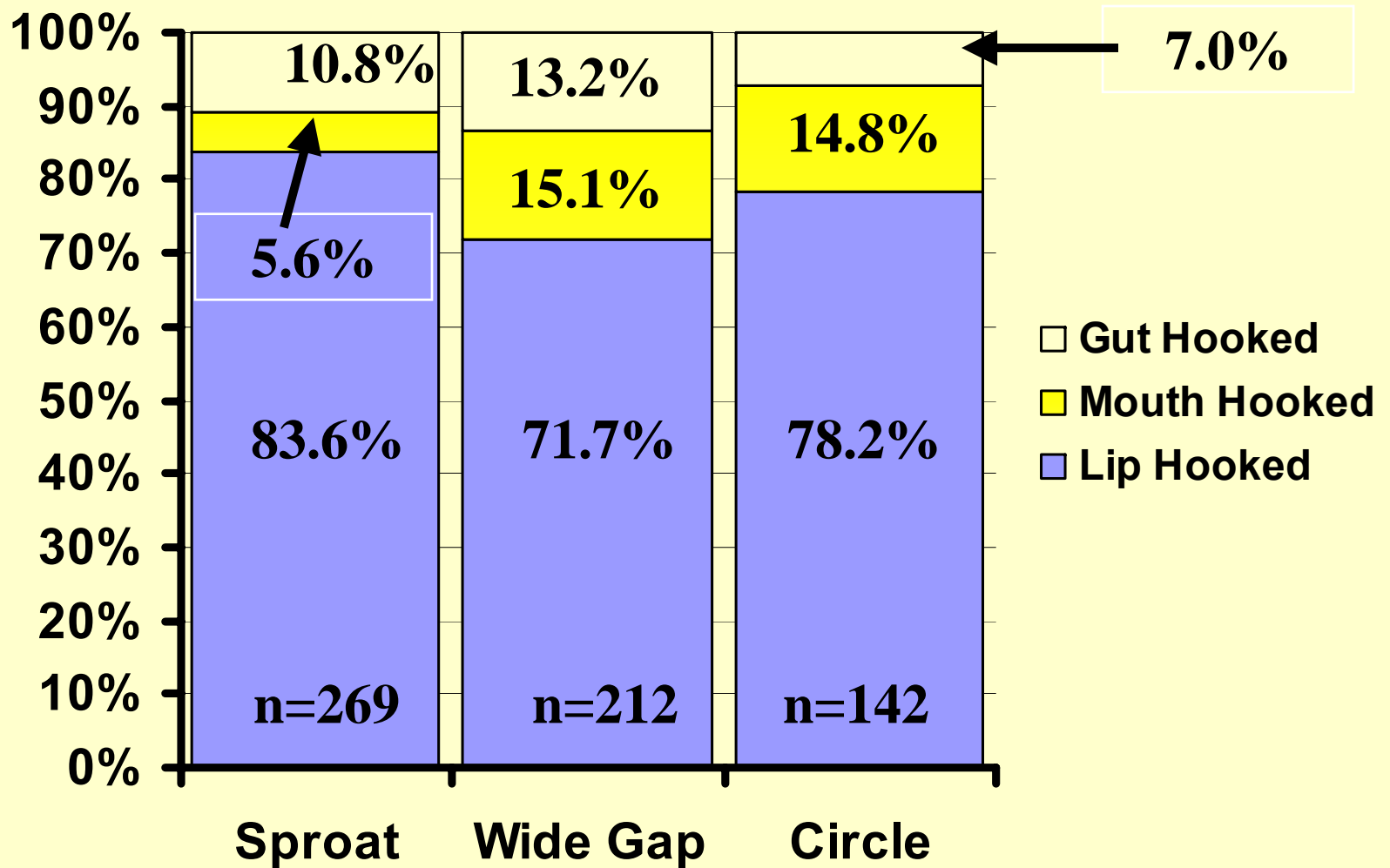


Thousands of fish released – how many live?



	Temp (oC)	Salinity (ppt)	Number of fish	Percent Mortality
Trial 1	27	29	26	0.0
Trial 2	23	23	31	6.5
Trial 3	23	25	26	3.8
Trial 4	22	32	7	0.0
Total			90	
Mean mortality (%)				2.6
95% Confidence Interval				0.6-7.0

Hook Type vs. Wound Location (summer flounder)



Logistic Regression Results

Parameter	Probability
Leader status	<0.0001
Hook type	>0.05
Wound location	<0.0001
Bleeding	<0.0001
Temperature in degrees Celsius	<0.05
Length (mm)	>0.82
Bleeding*Hook Type (interaction)	<0.0001
Bleeding*Length (interaction)	<0.01

From Malchoff et al., 2002

Overall Summer Flounder Mortality

	NY	VA – NC combined	Overall (total)
Mortality	14.6	6.1	9.5
95% CI	7.9 – 21.2	3.2 – 9.5	7.4 – 11.9
Sample	247	376	623

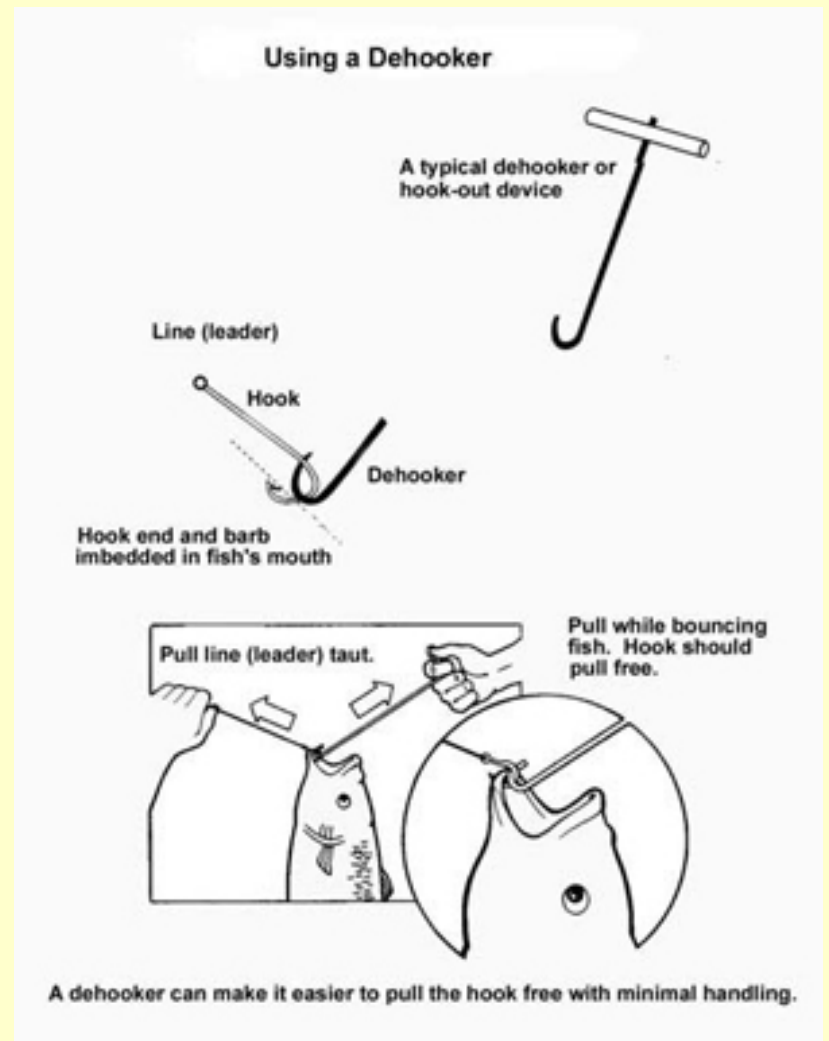
From Malchoff et al., 2002

Other studies

- Circle hooks significant predictor of wound location in tuna. Bluefin c&r mortality estimated at 4% with circle hooks, and 28% on straight hooks (Skomal, Chase and Prince, 2002)
- Circle hooks resulted in lower mortality in 16 species in pelagic longline fishery (Falterman and Graves, 2002)
- “Careful release” (rolling hook out, cutting gangion) reduced discard mortality to 11% in Pacific halibut fishery (Trumble, Kaimmer, and Williams, 2002)
- Fewer striped bass were deeply hooked (10.6% vs. 45.6%) with circle hooks as compared to standard hooks in Chesapeake Bay (Lukacovic and Uphoff, 2002)
- Little difference treble hooks and single hooks on mortality in spotted seatrout (Duffy, 2002)
- Mortality in tautog was significantly higher in deep-water (11-17 m) vs. shallow water (≤ 10 m) (Lucy and Arendt, 2002)

Recommendations

- Minimize stress
- Try circle hooks or barbless hooks to minimize wounding
- Set hook quickly if fishing live bait
- Use dehooker or other techniques to minimize handling
- Contact Sea Grant for additional advice



Questions?

Check out NYSG site at:

<http://www.seagrantsunysb.edu/Fishery/AnglerResource/Techniques/ReleasingFish.htm>

or the Florida Sea Grant site at:

<http://edis.ifas.ufl.edu/SG047>

Or..

Contact Mark Malchoff

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